the particular region **113** also preferably functions to inform the user of the type of input the deformation represents. For example, the deformation of the particular region **113** may be of a shape that indicates the type of input that the deformation represents. Alternatively, the sheet **110** may include tactile instructions, for example, a pattern of beads or substantially small protrusions that may be felt by the user on the particular region **113** that indicate the type of input the deformation represents. The tactile instructions on the particular region **113** may alternatively be any other type of feature that is able to be felt tactilely by the user.

[0022] The layer **110** and the substrate **120** of the preferred embodiment function to cooperatively define the cavity **125**. The layer **110** and substrate **120** are preferably similar to the layer and substrate disclosed and taught in U.S. application Ser. No. 12/319,334, but may alternatively be any suitable type. The layer **110** is preferably more pliable than the substrate **120** such that, as the cavity **125** expands, the layer **110** deforms while the substrate no remains relatively undeformed. If the user interface system **100** includes a display **150**, then the layer **110** and the substrate **120** are preferably both relatively transparent to allow the images displayed by the display **150** to be seen through the layer **110** and the substrate **120**. The layer **110** and the substrate **120** may also be index matched to allow light transmitted through without interruption. However, the layer **110** and the substrate **120** may be of any other suitable property. The layer **110** is preferably directly coupled to the substrate **120**. Alternatively, the user interface system **100** may include an additional layer in that is in arranged in between the layer **110** and the substrate **120**. The additional layer **111** may function as a support layer that includes perforations that allow for the fluid to expand the cavity **125** and deform the layer **110** and the particular region of the surface **113**. In this variation, the attachment point **112** is preferably arranged to couple the layer **110** to the additional layer **111**. Alternatively, the additional layer **111** may deform with the layer **110** and the particular region of the surface no. In this variation, the attachment point **112** is preferably arranged to couple the additional layer **111** to the substrate **120**. However, any other suitable arrangement of the layer **110**, the substrate **120**, and the attachment point **112** may be used.

[0023] As shown in FIG. **2**, the touch sensor **140** of the preferred embodiment functions to detect the presence of a user input proximate to the particular region **113** of the surface **115**. The touch sensor **140** preferably detects the presence of a user touch by detecting a force that inwardly deforms the deformed particular region **113** or any other portion of the surface **115**, but may alternatively detect the presence of a user touch by detecting the presence of the finger at a location proximate to the particular region **113**. The touch sensor **140** may be a capacitive sensor, a resistive sensor, a pressure sensor, or any other suitable type of sensor.

[0024] As shown in FIGS. **4-6**, the shape of the deformation of the particular region **113** is preferably one that is felt by a user through their finger (or multiple fingers). In a first variation, the shape of the deformation of the particular region **113** preferably acts as and provides the feeling of a button that can be pressed by the user, such as a keyboard (shown in FIGS. **4**, **5***a*, and **5***b*). In a second variation, the shape preferably acts and provides the feeling of a slider that can be pressed by the user in one location along the slider or that can be swept in a sliding motion along the slider, such as the "click wheel" of the Apple iPod-second generation (shown in FIG. **6**). In a third variation, the shape preferably acts and provides the feeling of a pointing stick that can be pressed by the user from multiple directions and/or locations along the surface whereby the user is provided with tactile feedback that distinguishes a first directional touch from a second directional touch and/or a touch in a first location from a touch in a second location, such as the pointing stick marketed by IBM as the TRACKPOINT and by Synaptics as the TOUCHSTYK, which are both informally known as the "nipple". The deformation may, however, act as any other suitable device or method that provides suitable tactile guidance and feedback. In the variation including a display **150**, the shape of the deformation of the particular region **113** also preferably functions to minimize the optical distortion of the image underneath the deformed particular region **113**.

[0025] The shape of the deformation of the particular region **113** is preferably controlled using one of three preferred embodiments. In a first preferred embodiment, the shape is controlled by the location of the attachment points **112** of the layer **110** to the substrate **120**. In a second preferred embodiment, the shape is controlled by the geometry of the layer **110** in relation to the attachment points **112**. In a third preferred embodiment, the shape is controlled by the material composition of the layer **110** in relation to the attachment points **112**. The invention is preferably of one of the three aforementioned embodiments, but may alternatively be any combination or permutation of the three aforementioned embodiments. In other words, the shape of the deformation of the particular region **113** may also be thought of as the result of a formula or combination of characteristics of the particular region **113** of the surface, such as the thickness of the material, the geometry of the material, the modulus of elasticity of the material, and the pressure applied to the particular region **113**, and/or the location of the attachment points **112**. In addition, any other suitable method for controlling the shape of the deformation of the particular region **113** may be used, for example, the shape of the deformation of the particular region **113** may be changed by adjusting the pressure provided by the displacement device **130** to expand the cavity **125**.

1. First Preferred Embodiment

Attachment Point Location

[0026] The first preferred embodiment utilizes the location of the attachment points **112** to control the shape of the distortion of the particular region **113**. As mentioned above, the perimeter of the particular region **113** is at least partially defined by the attachment points **112**. More specifically, the attachment point **112** defines a "transition point" between a first portion of the layer **110** located on a first side of the attachment point **112** that experiences significant deformation (the particular region **113**) and a second portion of the layer **110** located on a second side of the attachment point **112** that experiences little or no deformation. In the preferred embodiment, the attachment points **112** are preferably a series of continuous points that define an edge, but may alternatively be a series of non-continuous points. The attachment points **112** are preferably defined during the attachment process of the layer **110** to the substrate **120**. For example, the layer **110** may be attached to the substrate **120** using an adhesive, heat treatment, ultra-sonic bonding, oxygen plasma surface treatment, or any other techniques known to one skilled in the art. During the attachment process, a particular